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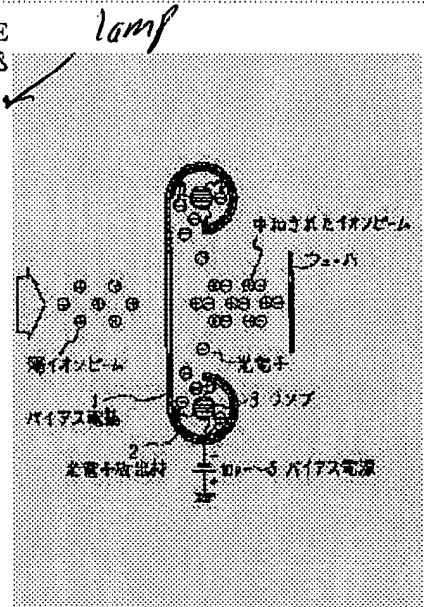
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(54) ION BEAM NEUTRALIZING DEVICE FOR ION IMPLANTING DEVICE

(57)Abstract:

PURPOSE: To neutralize ion beams efficiently by generating photoelectrons from a photoelectron emitting material by means of light generated in a lamp, and limiting the moving direction of these photoelectrons to be mixed with ion beams.

CONSTITUTION: An ion beam neutralizing device is provided with a layer of photoelectron emitting material 2 on the inner face of a deformed-doughnut-shaped electrode 1, and a doughnut-shaped lamp 3 in the center of the bias electrode. When light is generated from the lamp 3, photoelectrons are generated from the photoelectron emitting material 2, and the moving direction of these photoelectrons are limited by the bias electrode 1. When ion beams are implanted into an ion implantation object such as an Si wafer, for example, the ion beams are mixed with the photoelectrons via the ion neutralizing device so as to be neutralized, and then implanted into the wafer, so that neutralization can be carried out efficiently and stable performance can be exhibited for a long time.



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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to the neutralization equipment of the ion beam which just carried out the electric charge especially about the ion beam neutralization equipment of ion implantation equipment.

[0002]

[Description of the Prior Art] Conventionally, the filament 22 prepared in the direction of a right angle to the medial axis of an ion beam is heated according to the filament power source 24, and the ion beam neutralization equipment of this kind of ion implantation equipment generates a thermoelectron, as shown in the block diagram of drawing 4. A thermoelectron moves and collides toward the secondary-electron-emission plate 28 into which an ion beam side is forced in the migration direction in response to the effect of the electrode 21 which is in abbreviation 20V low voltage from a filament 22 according to the electrode power source 25 and which is in abbreviation 300V quantity potential from a filament 22 according to the acceleration power source 27, and emits secondary electron. neutralize

[0003] When the ion beam which just carried out the electric charge of the inside of this passes, it combines with an electron and an ion beam is neutralized electrically as a result. An ammeter 26 directs quantitatively the amount of electrons used for neutralization of an ion beam. In addition, although each power sources 24, 25, and 27 and an ammeter 26 are usually installed into atmospheric air among the ion beam neutralization equipment of above-mentioned ion implantation equipment, others are installed into the vacuum.

[0004]

[Problem(s) to be Solved by the Invention] With the ion beam neutralization equipment of the conventional ion implantation equipment mentioned above, since the electron used for neutralization had energy as large as 20-300eV and was moved at high speed, association was not given to short **** and an effectiveness target and the time amount which touches an ion beam was not fully able to neutralize an ion beam.

[0005] Moreover, in order to be greatly dependent on the surface state of a secondary-electron-emission plate, the emission ratio of secondary electron changes with the dirt of an emission plate front face, and emission of the stable secondary electron is difficult for emission of secondary electron. When dirt furthermore becomes severe, it becomes impossible for partial discharge to occur and use it. Therefore, it was difficult to obtain the neutralization engine performance of the ion beam stabilized in the long run. secondary emission

[0006]

[Means for Solving the Problem] The ion beam neutralization equipment of the ion implantation equipment of this invention is equipment which make the ion beam which was equipped with the lamp which generates light, the photoelectron-emission material which generates a photoelectron by light, the bias electrode which controls the migration direction of the generated photoelectron, and the power source for making a bias electrode into negative potential, and just carried out the electric charge mix a photoelectron, and it is made to neutralize. ion beam lamp light ion implantation photoelectron emission

[0007]

[Example] Next, this invention is explained with reference to a drawing. Drawing 1 is the perspective view showing the configuration in the example 1 of the ion beam neutralization equipment of the ion implantation equipment of this invention. This drawing shows the part installed into a vacuum, and the power source installed in an atmospheric-air side is omitted.

[0008] As shown in drawing 1, the ion beam neutralization equipment of this ion implantation equipment has the layer of the photoelectric-emission material 2 in the inside of the bias electrode 1 of a deformation doughnut form placed on the perpendicular field to the core of an ion beam, and has the lamp 3 of a doughnut form at that core further. 4 is a lamp terminal. A lamp 3 is partly fixed to the bias electrode 1 in a place, and the bias electrode 1 is fixed to a vacuum housing (it omits by a diagram) through an insulating material (it omits by a diagram).

[0009] Drawing 2 is drawing of longitudinal section showing the detail of drawing 1, and explains actuation of an example 1 using this drawing. Drawing 2 is an example at the time of using an ion-implantation object as Si wafer. The ion beam which it is going to pour in moves to the right from Hidari in drawing 2, and the middle, in the ion beam neutralization equipment of this example, and the neutralized ion beam is poured into a wafer. As for neutralization of an ion beam, a several eV photoelectron is first emitted from the photoelectric-emission material (for example, alkaline metals) which the lamp 3 emitted light according to the external power source (it omits by a diagram), and received the light. Moreover, since the bias electrode 1 has negative potential of about 10 V by bias power supply 5, the photoelectron with the several eV energy emitted previously moves to the

direction of an ion beam with high potential, and it is mixed and combined in an ion beam and it neutralizes an ion beam as a result. In addition, a lamp 3 uses a halogen lamp and a mercury lamp according to the property of photoelectric-emission material.

[0010] Drawing 3 is drawing of longitudinal section showing the configuration of the whole in the example 2 of this invention. In this example, the grid power source 17 which gives potential to the cylinder-like the grid electrode 16 and the grid electrode 16 using a wire gauze for controlling the amount of the photoelectron emitted to the example 1 described previously is added.

[0011] in this case, the grid electrode 16 -- the grid power source 17 -- the bias electrode 11 -- several -- V -- since only the photoelectron with larger energy among the photoelectrons emitted from the photoelectric-emission material 12 by making it high potential than grid electrode potential passes the grid electrode 16 and is used for neutralization of an ion beam, the amount of photoelectrons used for neutralization of an ion beam is controllable by controlling the electrical potential difference of a grid. Even if it changes the amount of an ion beam by this, the high ion beam neutralization equipment of flattery nature can be made.

[0012] Although the example described above described the example which has the configuration of a doughnut form on the vertical plane over ion beam shaft orientations, you may not be especially a doughnut form.

[0013]

[Effect of the Invention] As explained above, since the low photoelectron of energy was used for this invention, without using the large secondary electron of energy for neutralization of an ion beam, it becomes possible [neutralizing an ion beam efficiently]. Moreover, since it does not have consumables, such as a filament, it is possible to demonstrate the engine performance stabilized over the long period of time.

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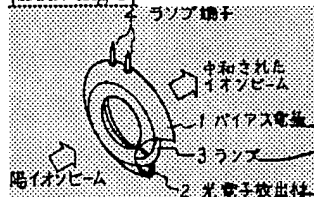
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DRAWINGS

[Drawing 1]

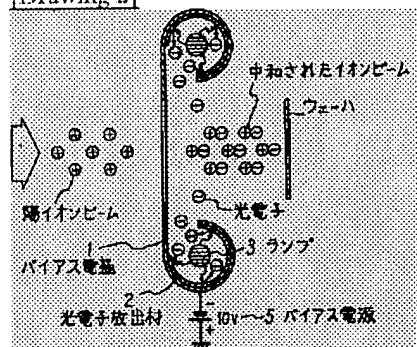


lamp

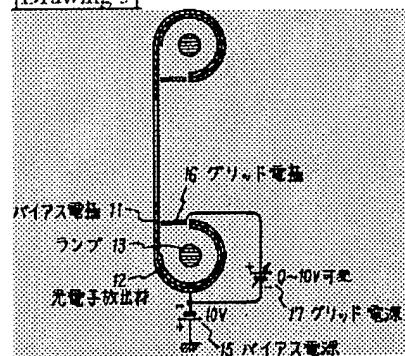
doughnut shaped electrode

photoelectron emitting material

[Drawing 2]

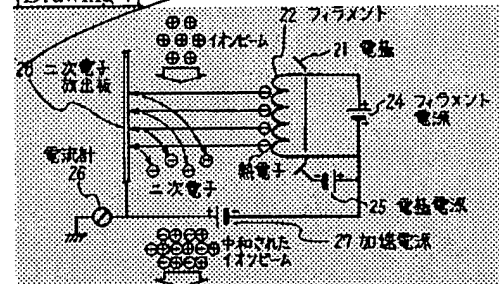


[Drawing 3]



secondary emission plate

[Drawing 4]



[Translation done.]